

Applicants: Yingjian Wang and Yingyi Wang  
For: **ARRAYS FOR BRINGING TWO OR MORE REAGENTS IN  
CONTACT WITH ONE OR MORE BIOLOGICAL TARGETS  
AND METHODS FOR MAKING AND USING THE ARRAYS**

1           1.       An array for bringing two or more reagents in contact with one or more biological  
2 targets comprising,  
3                   one or more reagents; and  
4                   one or more barriers adapted to at least temporarily maintain said reagents in at  
5 least one arrangement of two or more reagent portions so that said portions do not commingle  
6 with each other, wherein each said portion is maintained at a predefined locale in said  
7 arrangement so that each of said portions is adapted to be brought into contact with one or more  
8 biological targets.

1           2.       The array of claim 1, comprising at least two or more reagents wherein at least  
2 one of said reagent portions comprises all or part of two or more reagents.

1           3.       The array of claim 1, wherein one or more of said reagents is selected from a  
2 group consisting of DNA, RNA, antibodies, peptides, proteins, enzymes, carbohydrates,  
3 oligonucleotides, recombinant vectors, drugs, viruses, bacteria, mammalian cells, small organic  
4 molecules, and large organic molecules.

1           4.       The array of claim 1, wherein one or more of said barriers comprises one or more  
2 at least partial capillary tubes.

1           5.       The array of claim 4, wherein one or more of said capillary tubes is made of at  
2 least one material selected from a group consisting of plastic, glass, nitrocellulose,  
3 nitrobenzyloxymethyl cellulose, aminobenzlyoxymethyl cellulose, aminophenylthioether  
4 cellulose, diethylaminoethyl cellulose, and polyvinylidene flouride.

1 6. The array of claim 4, wherein said capillary tubes have diameters between 1  $\mu$ m to  
2 1cm..

1 7. The array of claim 4, wherein one or more of said arrangements comprises  
2 between 10 to 100,000 capillary tubes.

1 8. The array of claim 7, wherein said capillary tubes have diameters between 1  $\mu$ m  
2 and 1 cm.

1 9. The array of claim 4, wherein one or more of said arrangements comprises  
2 between 100 and 10,000 capillary tubes.

1 10. The array of claim 4, wherein one or more of said arrangements comprises a  
2 cross-sectional slice of a plurality of said capillary tubes.

1 11. The array of claim 10, wherein said capillary tubes of said cross-sectional slice  
2 have a height between about 1  $\mu$ m to 1cm.

1 12. The array of claim 10, wherein said capillary tubes of said cross-sectional slice  
2 have a height between about 10  $\mu$ m to 1cm.

1 13. The array of claim 1, wherein one or more of said reagents are immobilized  
2 among said barriers using one or more carriers comprising one or more components selected  
3 from a group consisting of cellulose, carbolynmethylcellulose, agarose, dextran,  
4 polyaminopolystyrene, polylysine, ployacrylamides, and derivatives thereof.

5 14. The array of claim 1, wherein two or more of said reagent portions are adapted to  
6 be brought simultaneously into contact with two or more predefined, biological targets.

1 15. The array of claim 1, wherein one or more of said reagent portions are adapted to  
2 transfect one or more of said reagents into one or more predefined, biological targets.

1 16. The array of claim 1, wherein one or more of said reagent portions is adapted to  
2 stain one or more predefined, biological targets.

1 17. The array of claim 1, wherein one or more of said barriers comprises one or more  
2 supports having at least one substantially level surface comprising a plurality of spaces  
3 surrounding and between said reagent portions wherein said reagent portions are maintained at  
4 said predefined locations so that said portions do not commingle.

1 18. The array of claim 17, wherein one or more of said supports is made of at least  
2 one material selected from a group consisting of plastic, glass, nitrocellulose, nylon,  
3 polyvinylidene fluouride, and metal.

1 19. The array of claim 17, wherein one or more of said supports comprises one or  
2 more solid supports selected from a group consisting of rigid glass plates, rigid plastic plates,  
3 nitrocellulose membranes, nylon membranes, polyvinylidene difluoride membranes, metal  
4 membranes, and porous membranes.

1 20. The array of claim 17, wherein one or more of said supports comprise a layer of  
2 one or more polymers adapted to immobilize one or more of said reagents.

1 21. The array of claim 20, wherein one or more of said polymers are selected from a  
2 group consisting of polylysine and polyethyleneimine.

1        22. ✓ A method for making one or more arrays for bringing two or more reagents in  
2 contact with one or more biological targets comprising the steps of,  
3                providing one or more reagents; and  
4                providing one or more barriers adapted to at least temporarily maintain said  
5 reagents in at least one arrangement of two or more reagent portions;  
6                immobilizing said reagent portions in said arrangement so that said portions do  
7 not commingle with each other, whereby each said portion is maintained at a predefined locale in  
8 said arrangement so that each of said portions is adapted to be brought into contact with one or  
9 more biological targets.

1        23. The method of claim 22, wherein one or more of said barriers comprises one or  
2 more at least partial capillary tubes, and wherein said step of immobilizing comprises the steps  
3 of,  
4                introducing one or more of said reagents into said capillary tubes; and  
5                bundling said capillary tubes in said predefined arrangement.

1        24. The method of claim 23, further comprising the step of cutting said bundled  
2 capillary tubes into a plurality of cross-sectional slices.

1        25. The method of claim 23, wherein said step of introducing comprises the steps of,  
2 mixing one or more of said reagents with one or more carrier solutions; placing said mixture of  
3 reagents and carrier solution into one or more of said capillary tubes; at least partially solidifying  
4 said mixture until said mixture is substantially immobile.

1        26. The method of claim 25, further comprising the step of cutting said bundled  
2 capillary tubes into a plurality of cross-sectional slices.

1           27.     The method of claim 23, wherein one or more of said capillary tubes is made of at  
2     least one material selected from a group consisting of plastic, glass, nitrocellulose,  
3     nitrobenzyloxymethyl cellulose, aminobenzyloxymethyl cellulose, aminophenylthioether  
4     cellulose, diethylaminoethyl cellulose, and polyvinylidene fluoride.

1           28.     The method of claim 23, wherein one or more of said arrangements comprises  
2     between 10 and 100,000 capillary tubes.

1           29.     The method of claim 23, wherein one or more of said arrangements comprises at  
2     least 10,000 capillary tubes.

1           30.     The method of claim 22, wherein one or more of said reagents are immobilized  
2     among said barriers using one or more carriers comprising one or more components selected  
3     from a group consisting of cellulose, carbolymethylcellulose, agarose, dextran,  
4     polyaminopolystyrene, polylysine, polyacrylamides, and derivatives thereof.

1           31.     The method of claim 23, further comprising the steps of removing said reagent  
2     portions from said tubes and fixing said portion to one or more supports having one or more  
3     substantially level surfaces wherein said reagent portions are maintained at said predefined  
4     locations so that said portions do not commingle.

1           32.     The method of claim 31, wherein said step of fixing further comprises the steps  
2     of,  
3                 pretreating one or more of said surfaces by applying one or more layers of one or  
4     more polymers, adapted to interact with one or more of said reagents.

1           33.     The method of claim 32, wherein one or more of said polymers is selected from a  
2     group consisting of polylysine and polyethyleneimine.

1           34.    The method of claim 31, wherein one or more of said supports is made of at least  
2   one material selected from a group consisting of plastic, glass, nitrocellulose, nylon,  
3   polyvinylidene fluoride, and metal.

1           35.    The method of claim 31, wherein one or more of said supports comprises one or  
2   more solid supports selected from a group consisting of rigid glass plates, rigid plastic plates,  
3   nitrocellulose membranes, nylon membranes, polyvinylidene difluoride membranes, metal  
4   membranes, and porous membranes.

1           36.    The method of claim 22, wherein one or more of said reagents is selected from a  
2   group consisting of DNA, RNA, antibodies, peptides, proteins, enzymes, carbohydrates,  
3   oligonucleotides, recombinant vectors, drugs, viruses, bacteria, mammalian cells, small organic  
4   molecules, and large organic molecules.

1

1 37. A method for bringing two or more reagents in contact with one or more  
2 biological targets comprising the steps of,  
3 providing an array comprising,  
4 two or more reagents; and  
5 one or more barriers adapted to at least temporarily maintain said reagents in at  
6 least one arrangement of two or more reagent portions so that said portions do not commingle  
7 with each other, wherein each said portion is maintained at a predefined locale in said  
8 arrangement so that each of said portions is adapted to be brought into contact with one or more  
9 predefined, biological targets;  
10 providing one or more biological targets;  
11 designating an address to each reagent portion based on said predefined locale and  
12 an address to each of said biological targets;  
13 corresponding at least one of said reagent portions to at least one of said  
14 biological targets based on said designated reagent portion and biological target addresses;  
15 contacting said predefined reagent portions with their respective corresponding  
16 biological targets, whereby some or all of each specific reagent portion is transferred to said  
17 specific reagent portion's corresponding biological target.

1 38. The method of claim 37, wherein said array comprises at least two or more  
2 reagents and wherein at least one of said reagent portions comprises all or part of two or more  
3 reagents.

1 39. The method of claim 37, wherein one or more of said reagents is selected from a  
2 group consisting of DNA, RNA, antibodies, peptides, proteins, enzymes, carbohydrates,  
3 oligonucleotides, recombinant vectors, drugs, viruses, bacteria, mammalian cells, small organic  
4 molecules, and large organic molecules.

1 40. The method of claim 37, wherein one or more of said barriers comprises one or  
2 more at least partial capillary tubes.

1 41. The method of claim 40, wherein said barriers comprise a plurality of bundled  
2 capillary tubes.

1 42. The method of claim 41, wherein said barriers comprise one or more cross-  
2 sectional slices of said plurality of bundled capillary tubes.

1 43. The method of claim 37, wherein said barriers comprise one or more supports  
2 having at least one substantially level surface comprising a plurality of spaces surrounding and  
3 between said reagent portions wherein said reagent portions are maintained at said predefined  
4 locations so that said portions do not commingle.

1 44. The method of claim 43, wherein one or more of said supports comprises one or  
2 more solid supports selected from a group consisting of rigid glass plates, rigid plastic plates,  
3 nitrocellulose membranes, nylon membranes, polyvinylidene difluoride membranes, metal  
4 membranes, and porous membranes.

1 45. The method of claim 43, wherein one or more of said supports comprises a layer  
2 of one or more polymers adapted to immobilize one or more of said reagents.

1 46. The method of claim 37, wherein said step of providing two or more biological  
2 targets comprises the step of seeding and adhering two or more target cells on one or more cell  
3 growth supports.



1           47.    The method of claim 37, wherein said step of contacting said predefined reagent  
2   portions with their respective corresponding biological targets, whereby some or all of each  
3   specific reagent portion is transferred to said specific reagent portion's corresponding biological  
4   target, comprises the step of, seeding and adhering one or more of said biological targets on said  
5   biological targets' corresponding predefined reagent portions.

1           48.    The method of claim 37, wherein said step of contacting step comprises the step  
2   of applying one or more conditions to one or more of said reagent portions to facilitate said  
3   transfer of some or all of each specific reagent portion to said specific reagent portion's  
4   corresponding biological target.

1           49.    The method of claim 48, wherein said step of applying one or more conditions  
2   comprises the step of applying one or more electric pulses to one or more of said reagent  
3   portions.  
4

50. A method for bringing two or more reagents in contact with one or more biological targets comprising the steps of,

providing an array comprising,

two or more reagents; and

one or more barriers adapted to at least temporarily maintain said reagents in at least one arrangement of two or more reagent portions so that said portions do not commingle with each other, wherein each said portion is maintained at a predefined locale in said arrangement so that each of said portions is adapted to be brought into contact with one or more predefined, biological targets;

providing one or more biological targets;

designating an address to each reagent portion based on said predefined locale and an address to each of said biological targets;

corresponding at least one of said reagent portions to at least one of said biological targets based on said designated reagent portion and biological target addresses;

contacting said predefined reagent portions with their respective corresponding biological targets, whereby some or all of each target is transferred to said target's corresponding specific reagent portion.